

Name: _____

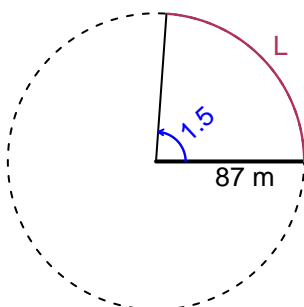
Date: _____

Trig Final (SLTN v682)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.5 radians. The radius is 87 meters. How long is the arc in meters?

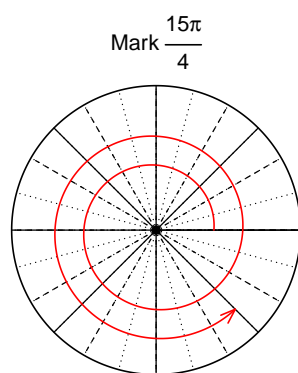


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 130.5$ meters.

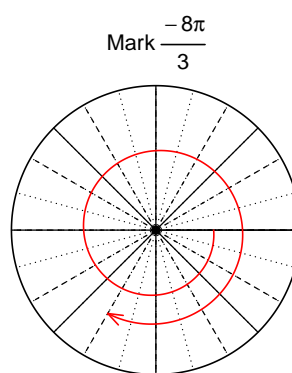
Question 2

Consider angles $\frac{15\pi}{4}$ and $-\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(-\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(15\pi/4)$

$$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$$



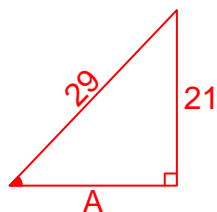
Find $\sin(-8\pi/3)$

$$\sin(-8\pi/3) = -\frac{\sqrt{3}}{2}$$

Question 3

If $\sin(\theta) = \frac{-21}{29}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

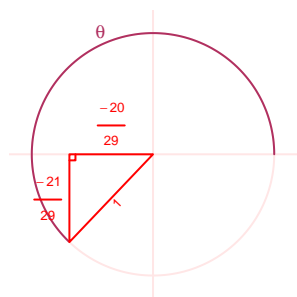
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 21^2 &= 29^2 \\A &= \sqrt{29^2 - 21^2} \\A &= 20\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-21}{29}}{\frac{-20}{29}} = \frac{21}{20}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.02 meters, a midline at $y = -4.84$ meters, and a frequency of 3.8 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.02 \cos(2\pi 3.8t) - 4.84$$

or

$$y = -8.02 \cos(7.6\pi t) - 4.84$$

or

$$y = -8.02 \cos(23.88t) - 4.84$$